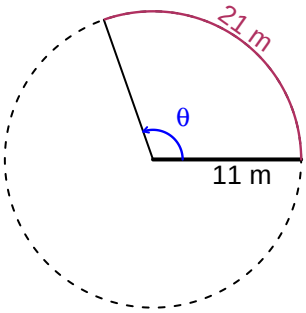
Name: Date:

Trig Final (SLTN v684)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 11 meters. The arc length is 21 meters. What is the angle measure in radians?

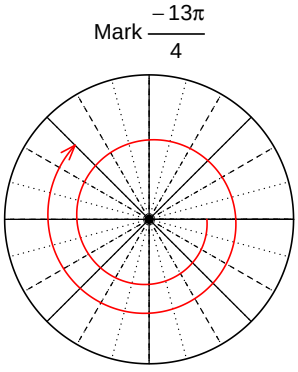


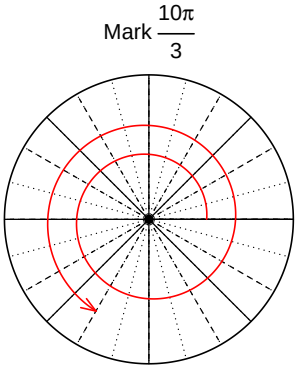
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 1.909$ radians.

Question 2

Consider angles $\frac{-13\pi}{4}$ and $\frac{10\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-13\pi}{4}\right)$ and $\cos\left(\frac{10\pi}{3}\right)$ by using a unit circle (provided separately).





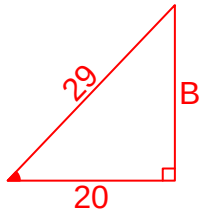
$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(10\pi/3) = \frac{-1}{2}$

Question 3

If $\cos(\theta) = \frac{20}{29}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

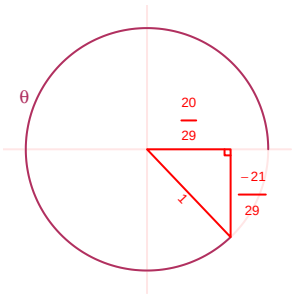
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$20^2 + B^2 = 29^2$$
$$B = \sqrt{29^2 - 20^2}$$
$$B = 21$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-21}{29}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -7.43$ meters, an amplitude of 5.92 meters, and a frequency of 8.47 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.92\cos(2\pi 8.47t) - 7.43$$

or

$$y = 5.92\cos(16.94\pi t) - 7.43$$

or

$$y = 5.92\cos(53.22t) - 7.43$$